

REMARKS

This amendment is in response to the Final Office Action of May 9, 2002 and the Advisory Action of July 17, 2002.

Claims 1 through 6 and 8 through 16 are currently pending in the application.

Claim 7 has been canceled.

Claims 1 through 6, 8 through 11, 15 and 16 stand rejected.

Claims 12 through 14 are objected to.

Claims 1 through 3 and 9 through 11 and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Boyd et al. (United States Patent 5,788,143) in view of Mays et al. (United States Patent 6,196,439).

Claims 12 through 14 were objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 4 through 6 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. § 112, second paragraph, set forth in this Office Action and to include all of the limitations of the base claim and any intervening claims.

Applicants thank the Examiner for the indication of allowable subject matter.

Applicants respectfully request reconsideration of the application as amended herein.

35 U.S.C. § 102(e) rejections as being anticipated by Boyd et al. (United States Patent 5,788,143)

Claims 8 and 15 were rejected under 35 U.S.C. § 102(e) as being anticipated by Boyd et al. (United States Patent 5,788,143). Applicants respectfully traverse this rejection, as hereinafter set forth.

Again, Applicants submit that a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The

identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Boyd et al. appears to disclose a single passageway (214) leading from a “vacuum pickup head” (211) as shown in FIG. 2. Boyd et al. discloses using a “control means” (215) to determine when suction from a vacuum pump will be supplied to the passageway (214) in order to pick up solder particles when the suction is supplied and release the particles when the suction is not supplied so they can fall under the influence of gravity (col. 4, lines 24 through 31 and 49 through 51.) Boyd et al. also makes a generalized disclosure of using positive pressure to eject the particles from the pickup head (211) (see col. 5, lines 13 through 17.)

However, Applicants submit that the Boyd et al. patent fails to anticipate each and every element as set forth in claims 8 and 15, as amended and presented herein. In particular, Boyd et al. fails to set forth the elements of the presently claimed invention calling for “a passageway leading from said chamber to a vacuum source, a passageway leading from said chamber to a pressurized gas, a first controllable valve apparatus for controlling opening and closing said vacuum passageway; and a second controllable valve apparatus for controlling opening and closing said pressurized gas passageway”. Therefore, Applicants respectfully request that the rejection of claims 8 and 15 be withdrawn.

35 U.S.C. § 103(a) rejections as being unpatentable over Boyd et al. (United States Patent 5,788,143) in view of Mays et al. (United States Patent 6,196,439)

Claims 1 through 3, 9 through 11 and 16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Boyd et al. (United States Patent 5,788,143) in view of Mays et al. (United States Patent 6,196,439). Applicants respectfully traverse this rejection as hereinafter set forth.

Applicants again further submit that to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of

ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Third, the cited prior art reference must teach or suggest all of the claim limitations. Furthermore, the suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicants' disclosure.

Regarding claim 1, a *prima facie* case of obviousness is not met because the combined prior art references of Boyd et al. and Mays et al. do not teach or suggest all of the claim limitations of claim 1 as amended and presented herein. Specifically, the prior art references do not teach or suggest "[a] pickup tool for placing preformed solder balls on a substrate, comprising: a tool body controllably movable in multiple axes and rotatable about an axis; a plurality of ball seats formed in said body for said preformed solder balls, said plurality of ball seats each having an aperture therein; passageways leading from said aperture to a vacuum source and to a pressurized gas source, a first valve apparatus for controlling separately and independently a vacuum to said ball seats, said vacuum retaining said solder balls on said ball seats, and a second valve apparatus for controlling separately and independently a gas under pressure to said ball seats, said gas under pressure for releasing said solder balls from said ball seats" as recited in presently amended claim 1. Rather, Boyd et al. appears to disclose a single passageway (214) leading from a "vacuum pickup head" (211) (see FIG. 2) and a single "control means" (215) to determine when suction from a vacuum pump is applied (col. 4, lines 24 through 31.) Mays et al., while disclosing an apparatus which applies a vacuum source to pick up an electronic device (col. 5, lines 51 through 54), appears to be silent on the subject matter of using pressurized gas to release the electronic device from the apparatus or pathways leading to a vacuum pump and a pressurized gas which can be controlled separately. Therefore, Applicants respectfully request that the rejection of claim 1 be withdrawn.

Claims 2 and 3 are each allowable as depending from now amended claim 1 which is allowable.

Claim 9 is allowable, among other reasons, as depending from now amended claim 8 which is allowable. Amended claim 9 is further allowable as it recites, *inter alia*, "a heater to heat said pickup tool." There is no motivation to modify Boyd et al. with the teachings of Mays et al. by adding a heater to the pickup head of Boyd et al.. Mays et al. teaches conducting heat through a pickup tool to an electronic device being picked up by the tool in order to heat solder balls that have come in contact with the electronic device (col. 5, lines 57 through 61.) There is a lack of motivation to combine the two references because the pick up head used in Boyd et al. never comes into contact with any electronic device in order to conduct heat through it to the solder balls.

Further, while Boyd et al. teaches picking up solder balls with a pick up tool, it actually teaches away from transferring heat to the solder balls through conduction via the pick up head as taught by Mays et al.. Boyd et al. teaches that once the solder balls have been placed on the contacts of the direct chip attach (DCA) chip sites, the pick up head is moved away from the DCA site and that a reflow head (511) with a heat source (512) is positioned over the site to apply heat to the solder particles (*see* FIG. 5; col. 4, lines 50 through 57.) Thus, the apparatus and method taught by Boyd et al. provides that no contact is made between the pick up head and the solder balls (or electronic device) while the solder balls are being heated. Therefore, applicants respectfully request that the rejection of claim 9 be withdrawn.

Regarding claim 10, a *prima facie* case of obviousness is not met because the combined prior art references of Boyd et al. and Mays et al. do not teach or suggest all of the claim limitations of claim 10 as amended and presented herein. Specifically, the prior art references do not teach or suggest "[a] pickup tool for placing preformed solder balls on a substrate, comprising: a tool body controllably movable in multiple axes and rotatable about an axis; a plurality of ball seats formed in said tool body for a plurality of solder balls, each ball seat of said plurality of ball seats having an aperture therein; passageways leading from said aperture to a vacuum source and to a pressurized gas; a first controllable valve apparatus controlling the vacuum, said vacuum retaining said solder ball in each said ball seat; and a second controllable

valve apparatus controlling the pressurized gas to said ball seat, said pressurized gas for releasing said solder ball from said ball seat” as recited in presently amended claim 10. Rather, Boyd et al. appears to disclose a single passageway (214) leading from a “vacuum pickup head” (211) (see FIG. 2) and a single “control means” (215) to determine when suction from a vacuum pump is applied (col. 4, lines 24 through 31.) Mays et al., while disclosing an apparatus which applies a vacuum source to pick up an electronic device (col. 5, lines 51 through 54), appears to be silent on the subject matter of using pressurized gas to release the electronic device from the apparatus or pathways leading to a vacuum pump and a pressurized gas. Therefore, Applicants respectfully request that the rejection of claim 10 be withdrawn.

Claim 11 is allowable as depending from now amended claim 10 which is allowable. Claim 16 is allowable, among other reasons, as depending from now amended claim 15 which is allowable. Amended claim 16 is further allowable as it recites, *inter alia*, “a heater to heat said solder balls.” As discussed above, there is no motivation to modify Boyd et al. with the teachings of Mays et al. by adding a heater to the pickup head of Boyd et al.. Mays et al. teaches conducting heat through a pickup tool to an electronic device being picked up by the tool in order to heat solder balls that have come in contact with the electronic device (col. 5, lines 57 through 61.) There is a lack of motivation to combine the two references because the pick up head used in Boyd et al. never comes into contact with any electronic device in order to conduct heat through it to the solder balls.

Further, while Boyd et al. teaches picking up solder balls with a pick up tool, it teaches away from transferring heat to the solder balls through conduction via the pick up head as taught by Mays et al.. Boyd et al. teaches that once the solder balls have been placed on the contacts of the direct chip attach (DCA) chip sites that the pick up head is moved away from the DCA site and that a reflow head (511) with a heat source (512) is positioned over the site to apply heat to the solder particles (see FIG. 5; col. 4, lines 50 through 57.) Thus, the apparatus and method taught by Boyd et al. provides that no contact is made between the pick up head and the solder

balls (or electronic device) while the solder balls are being heated. Therefore, applicants respectfully request that the rejection of claim 16 be withdrawn.

Objections to claims 12 through 14/Allowable subject matter

Claim 12 has been amended to be in independent form to include the subject matter of independent claim 10. Therefore, claim 12 and dependent claims 13 and 14 therefrom are allowable.

Applicants request entry of this amendment for the following reasons:

The amendment places the application in condition for allowance.

The amendment does not require any further consideration or search.

The amendment reduces the number of issues for any subsequent appeal of the rejected claims.

In summary, Applicants submit that claims 1 through 6 and 8 through 16 are clearly allowable over the cited prior art for the reasons set forth herein..

Applicants request the entry of this amendment, the allowance of claims 1 through 6 and 8 through 16, and the case passed for issue.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

A marked-up version of each of the presently amended claims, highlighting the changes thereto, follows:

1. (Twice Amended) A pickup tool for placing preformed solder balls on a substrate, comprising:
a tool body controllably movable in multiple axes and rotatable about an axis;
a plurality of ball seats formed in said body for said preformed solder balls, said plurality of ball seats each having an aperture therein;
passageways leading from said aperture to a vacuum source and to a pressurized gas source;
[and]
a first valve apparatus for controlling separately and independently a vacuum [and a gas under pressure] to said ball seats, said vacuum retaining said solder balls on said ball seats[, and said pressurized gas releasing said solder balls from said ball seats]; and
a second valve apparatus for controlling separately and independently a gas under pressure to said ball seats, said gas under pressure for releasing said solder balls from said ball seats.

8. (Twice Amended) A pickup tool for placing a plurality of solder balls on ball-grid-array bond pads of a substrate, said pickup tool comprising:
a pickup tool body with a hollow chamber therein;
a lower plate having a plurality of seats therein for retaining a solder ball in each seat, said plurality of seats corresponding to an inverted configuration of an array of bond pads on a substrate;
a plurality of passageways leading from each said seat to said hollow chamber;
a passageway leading from said chamber to a vacuum source;
a passageway leading from said chamber to a pressurized gas; [and]

a first controllable valve apparatus for controlling opening and closing said vacuum [and pressurized gas passageways] passageway; and
a second controllable valve apparatus for controlling opening and closing said pressurized gas passageway.

10. (Twice Amended) A pickup tool for placing preformed solder balls on a substrate, comprising:
a tool body controllably movable in multiple axes and rotatable about an axis;
a plurality of ball seats formed in said tool body for a plurality of solder balls, each ball seat of said plurality of ball seats having an aperture therein;
passageways leading from said aperture to a vacuum source and to a pressurized gas; [and]
a first controllable valve apparatus controlling the vacuum [and the pressurized gas to said ball seat], said vacuum retaining said solder ball in each said ball seat [and said pressurized gas releasing said solder ball from said ball seat]; and
a second controllable valve apparatus controlling the pressurized gas to said ball seat, said pressurized gas for releasing said solder ball from said ball seat.

12. (Amended) A pickup tool for placing preformed solder balls on a substrate, comprising:
a tool body controllably movable in multiple axes and rotatable about an axis;
a plurality of ball seats formed in said tool body for a plurality of solder balls, each ball seat of said plurality of ball seats having an aperture therein;
passageways leading from said aperture to a vacuum source and to a pressurized gas; and
controllable valve apparatus controlling the vacuum and the pressurized gas to said ball seat, said vacuum retaining said solder ball in each said ball seat and said pressurized gas releasing said solder ball from said ball seat;
[The pickup tool of claim 10, further comprising:]

a solder ball dispenser supplying solder balls to said pickup tool, comprising:
a tubular ramp for feeding solder balls to said ball seat, said ramp having an upper end and a lower end;
a controllable valve at the lower end of said ramp for releasing a single solder ball to said ball seat while a vacuum is applied to said ball seat;
a reservoir for providing a supply of solder balls to move downwardly through said ramp.

15. (Twice Amended) A pickup tool for placing a plurality of solder balls on ball-grid-array bond pads of a substrate, said pickup tool comprising:
a pickup tool body with a hollow chamber therein;
a lower plate having a plurality of seats therein for attracting and retaining a solder ball in each seat, said plurality of seats corresponding to an inverted array of bond pads on a substrate;
passageways leading from each said seat of said plurality of seats to said hollow chamber;
a passageway leading from said chamber to a vacuum source;
a passageway leading from said chamber to a pressurized gas; [and]
a first controllable valve apparatus for controlling opening and closing said vacuum [and pressurized gas passageways] passageway; and
a second controllable valve apparatus for controlling opening and closing said pressurized gas passageway.